

Outliers

- tend to be extreme in y-direction
ex: (17, 121)
- outside overall pattern
- large residual

Influential Observations

- tends to be extreme in x-direction
ex: (42, 57)
- often near LSR line
- often makes r, r^2 stronger
- small residual
- have significant effect if removed

Complete worksheet 2.4- Association versus Causation

two variables are
related

one variable
cause the other
variable to
change

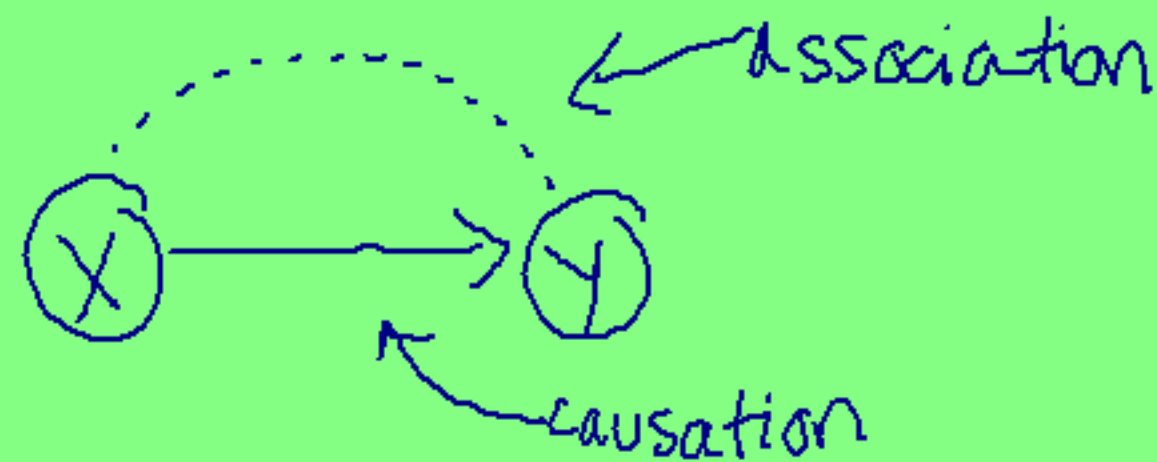
Association \neq causation

Association vs. Causation

Types of responses between x and y:

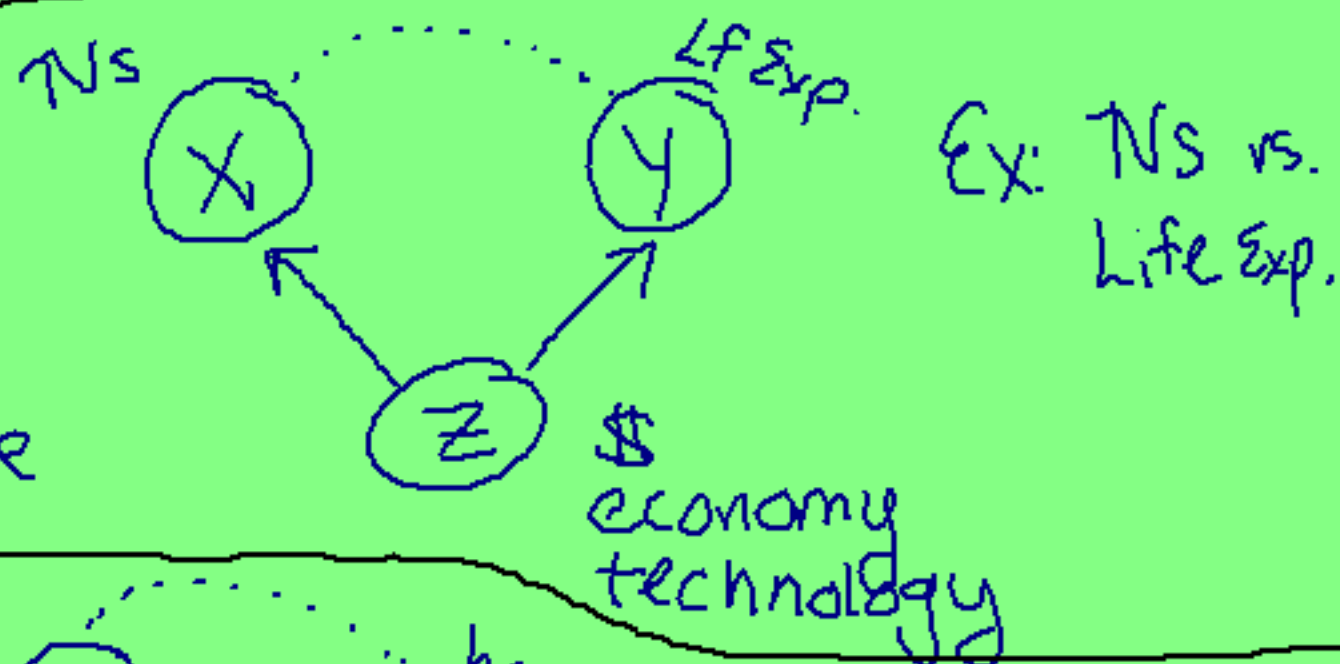
1) ^{association} Causation:

- x is causing y to change



2) Common Response:

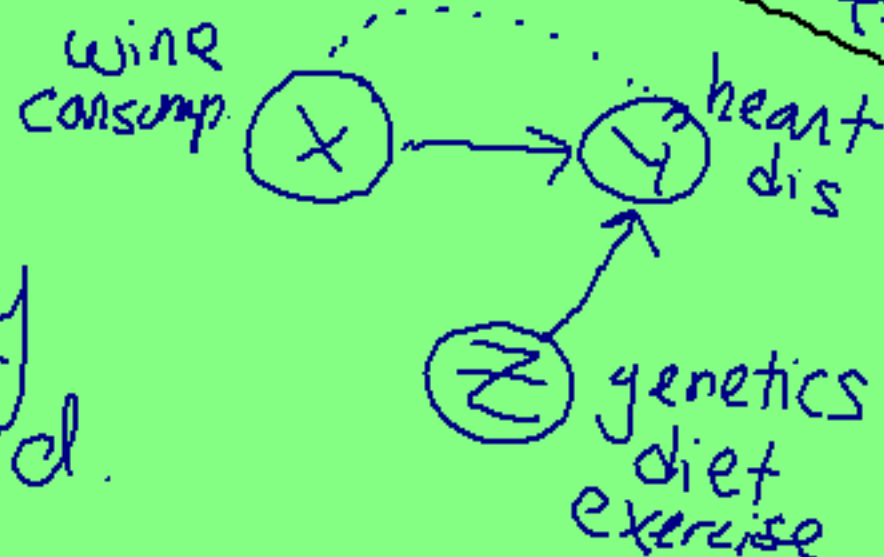
- the changes in x and y are due to a lurking variable



Ex: Ns vs. Life Exp.

3) Confounding:

- two variables are confounded when their effects on y can't be separated.



Ex: wine consump. vs. heart dis.

How can we establish causation?

- carefully designed expt.

How can we establish causation when we can do an expt?

- the association is strong (high r and r^2)
- the association is consistent
- higher doses (values of explanatory variable) ... goes w/ stronger responses of y
- * The alleged cause... plausible
- The alleged cause... precedes the effect in time
- EX: Smoking increases lung cancer
 \wedge
 risk of